

## NID Application

### **Benefits Calculation, Monetization, and Resiliency Tab**

#### **A.1: Project Conditions**

## Project Conditions

The Proposed Project involves the construction of a new 110,000 acre-foot reservoir, on the Bear River between the existing Rollins and Combie reservoirs. The Proposed Project would involve construction of a new 275-foot dam. Figure 1 is an area-capacity curve for the proposed Centennial Reservoir. Figure 2 is an outflow capacity curve for Centennial Reservoir.

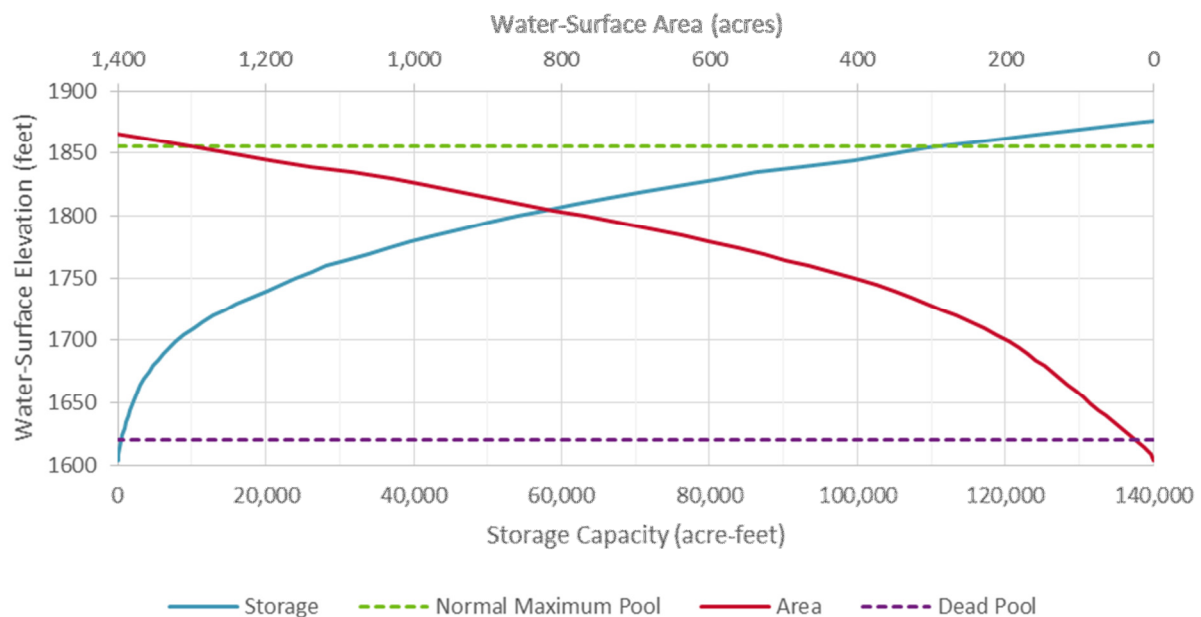


Figure 1: Area-capacity curve for the proposed Centennial Reservoir

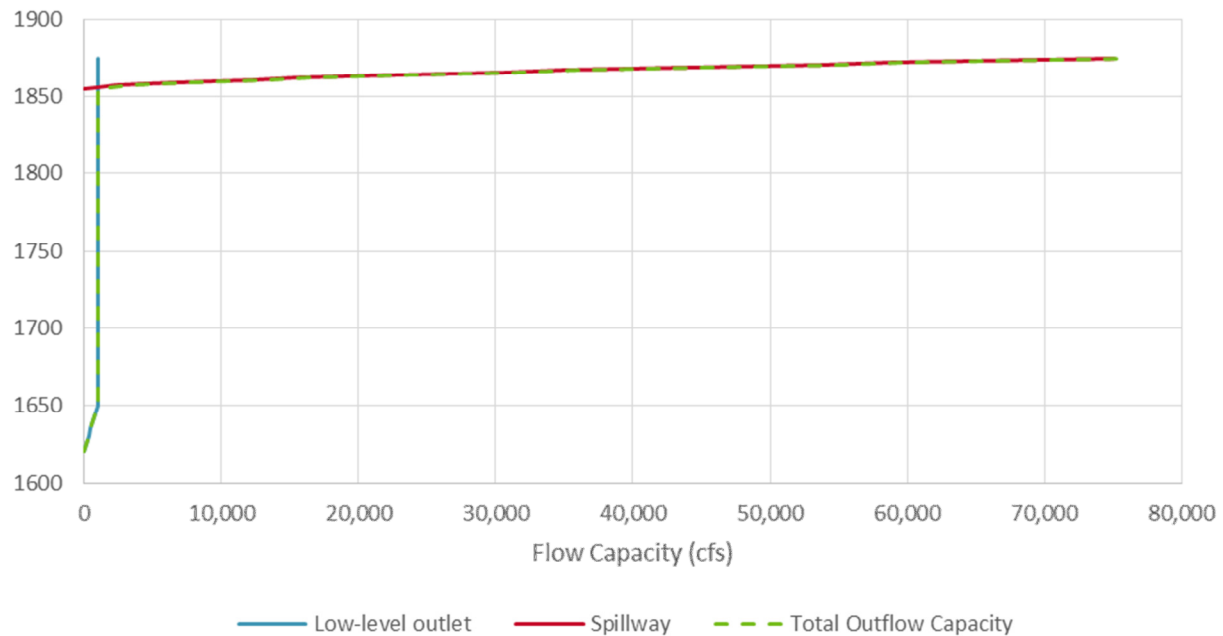


Figure 2: Flow capacity for the proposed Centennial Reservoir

The proposed Centennial Dam and Reservoir would operate as a “fill-and-spill” project, with a prioritization of maximizing reservoir storage during the winter and early spring runoff period. During the water delivery period (late spring through early fall), Centennial Reservoir would be used in coordination with NID’s existing reservoir network to provide water to customers in NID’s lower Bear River watershed service area. Centennial Reservoir would be managed in coordination with NID’s Rollins Reservoir upstream, as well as Lake Combie downstream, with diversions made to NID’s Combie Phase I Canal (see Figure 3). Centennial Reservoir could effectively be used in conjunction with NID’s existing Rollins Reservoir to expand the total storage capability in the Bear River watershed. This use would allow additional natural runoff in the Bear River watershed.

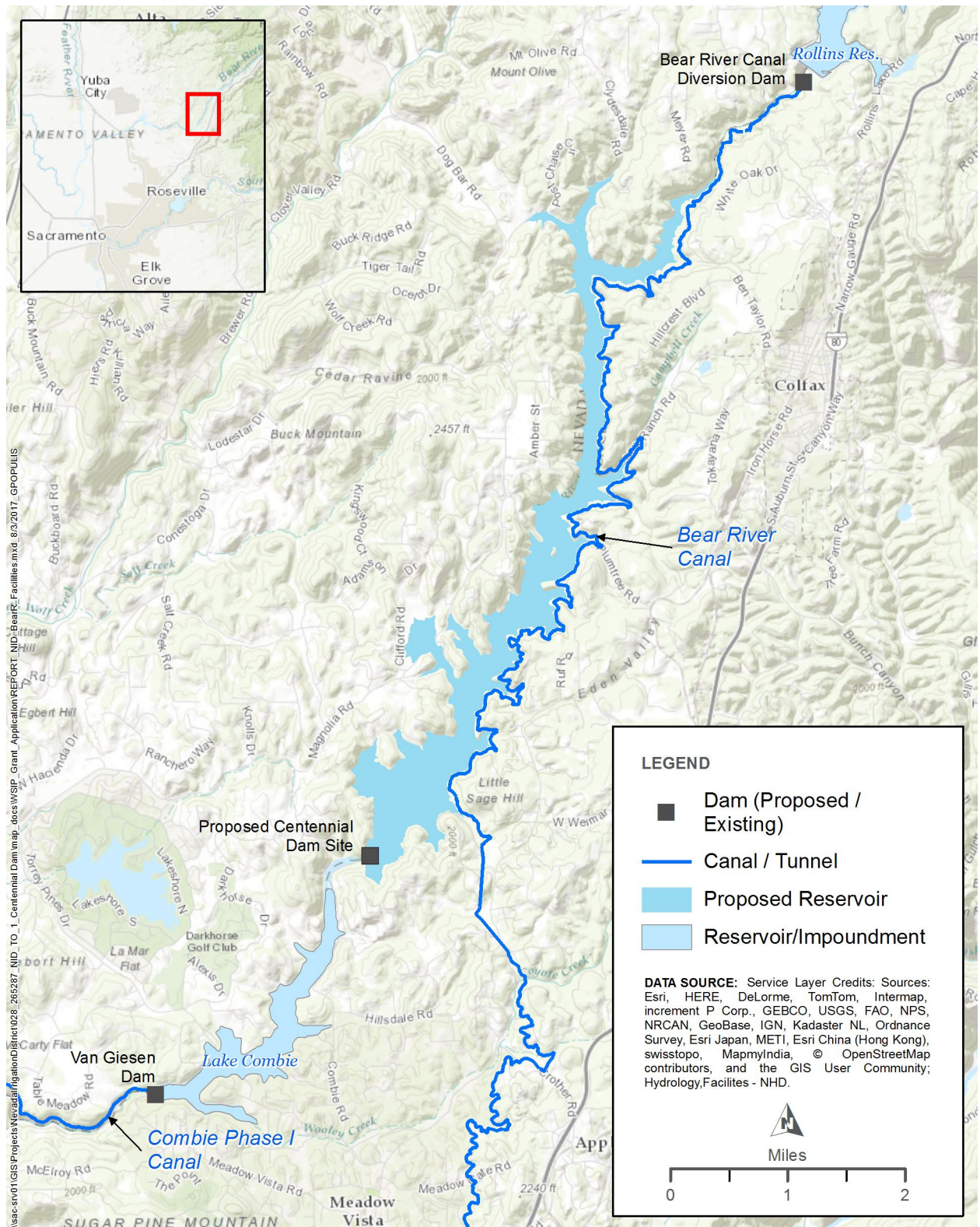


Figure 3: Bear River facilities map.

# Hydrologic Conditions

The following sections describe the with- and without-project hydrologic conditions.

## Hydrologic Input Data

NID previously developed historical unimpaired hydrology data during the FERC relicensing project of the Yuba-Bear Project (2266) for the period of water years 1976 to 2008. These data will be used to characterize existing condition hydrology. For the 2030 and 2070 conditions model runs, existing condition unimpaired hydrology input data will be modified using the VIC model results. Monthly ratios can be produced for each unimpaired hydrology sub-basin relating 2030 VIC output to 1995 VIC output, and 2070 VIC output to 1995 VIC output. Ratios will be applied as multipliers to the existing daily unimpaired inflow hydrology on a monthly basis for water years 1976 to 2008. These modified unimpaired hydrology will be used simulated the With- and Without-project scenarios for 2030 and 2070 using the HEC-ResSim operations model.

## With-Project Reservoir Operations Model Setup

The With-project scenarios will be identical to the Without-project scenarios upstream of Rollins Reservoir, in the Bear River. To simulate the current condition, 2030 and 2070 With-project scenarios, The Without-project HEC-ResSim models will be used with the operation of Centennial Reservoir turned on. This includes reservoir releases for the existing minimum instream flow requirement below Lake Combie and water delivery releases, and losses due to evaporation. A static conservation curve equaling 110,000 ac-ft will be assumed. Table 1 summarizes evaporation rate assumptions, based on data from Rollins Reservoir.

Table 1: Assumed monthly evaporation rates for Centennial Reservoir

<b>Month</b>	<b>Evaporation (inches)</b>
January	0.89
February	0.83
March	1.91
April	3.30
May	5.62
June	7.68
July	9.41
August	8.89
September	6.53
October	4.58
November	1.82
December	0.96



The difference between the simulated water deliveries under With-project conditions versus Without-project conditions will be used to quantify water supply yield of for benefit calculations.

## Coordination with Rollins Reservoir and Lake Combie

Under Without-project conditions, simulated releases from Rollins Reservoir will be made to meet NID and PG&E's Bear River Canal Diversion Dam diversion demands, and releases to the Bear River below the Bear River Canal Diversion Dam located immediately below Rollins Reservoir. Releases to the Bear River are typically the maximum of 1) NID's diversion demand in the Combie Phase I Canal at Lake Combie, or 2) the Federal Energy Regulatory Commission (FERC) license minimum instream flow requirement. In most months the Combie Phase I Canal demand exceeds the minimum instream flow requirement.

Under With-project conditions, simulated releases to the Bear River below the Bear River Canal Diversion Dam will be made to meet the minimum instream flow only, assuming Centennial Reservoir storage will be used to augment minimum flow releases from Rollins Reservoir to meet the full Combie Phase I Canal demand. It is anticipated that this modification to Rollins Reservoir operations will allow Rollins to reserve more water in carryover storage to offset drought impacts to NID and PG&E deliveries sourced by water from the Bear River Canal.

## Water Year Types

Water Year types used in this application will be NID's Yuba-Bear and PG&E's Drum-Spaulding hydroelectric projects proposed water year types, as accepted by FERC in the Final Environmental Impact Statement for Hydropower License (FERC/EIS-F-0244, December 2014). Water Year types are based on the DWR forecast of total unimpaired Runoff in the Yuba River at Smartsville or the DWR Full Natural Flow (FNF) near Smartsville. Water Year types are updated in the months of February, March, April, May and October as defined in Table 2. For the purposes of this application Extreme Critically Dry and Critically Dry year types are grouped together into Critically Dry for reporting.

Table 2. Water Year types for NID's Yuba-Bear and PG&E's Drum-Spaulding hydroelectric projects (FERC/EIS-F-0244, Volume 2, Table 3-98).

Water Year Type	DWR Forecast of Total Unimpaired Runoff in the Yuba River at Smartsville in Thousand Acre-Feet or DWR Full Natural Flow Near Smartsville for the Water Year in Thousand Acre-Feet <sup>1</sup>
Extreme Critically Dry	Equal to or Less than 615
Critically Dry	616 to 900
Dry	901 to 1,460
Below Normal	1,461 to 2,190
Above Normal	2,191 to 3,240
Wet	Greater than 3,240

<sup>1</sup> DWR rounds the Bulletin 120 Forecast to the nearest 1,000 acre-feet. The Full Natural Flow is provided to the nearest acre-foot, and Licensee will round DWR's Full Natural Flow to the nearest 1,000 acre-feet.

Existing condition Water Year types are based on historical DWR Bulletin 120 forecasts and Full Natural Flow. For 2030 and 2070 condition Water Year types, historical DWR Bulletin 120 runoff forecasts and FNF values were modified using the VIC model results. Annual ratios will

produce a representation of unimpaired runoff at the Yuba River at Smartsville plus Deer Creek. Ratios will be applied as multipliers to historical Bulletin 120 and FNF values within each Water Year.

## Ecosystem Conditions

Ecosystem With- and Without-project conditions are summarized in the Ecosystem Priority worksheets under the Physical Benefits tab.

## Recreation Conditions

Recreation With- and Without-project conditions are summarized in the Recreation Benefits summary under the Physical Benefits tab.